4-WIRE EXTENDED VOICE FREQUENCY (4WEVF) CHANNEL UNIT, 628270

GENERAL DESCRIPTION

CONTENTS PAGE

1. GENERAL 1
2. DESCRIPTION 1
3. FUNCTIONAL OPERATION (FIG. 2) 2
TRANSMIT VF CIRCUIT 2
RECEIVE VF CIRCUIT 2
TRANSMIT SIGNALING 2
RECEIVE SIGNALING 2
CARRIER GROUP ALARM 4
BUSY MODE 4
4. OPTIONS 4
5. RESTRICTIONS 4
6. TEST AND MAINTENANCE FEATURES 4
7. TECHNICAL SUMMARY 5
8. REPLACEABLE PARTS 6
9. REFERENCES 6

1. GENERAL

1.01 This Section provides a general description of the ITT D448 4-wire extended voice frequency (4WEVF) channel unit, 628270 (Fig. 1), to the functional block diagram level.

1.02 Whenever this Section is reissued, the reasons for reissue will be listed in this paragraph.

1.03 The unit provides a voice frequency (VF) and signaling interface between the central office (C.O.) equipment and the D448 multiplex terminal common equipment. In the transmit direction, the unit converts VF and signaling information into pulse code modulation (PCM) for application to the common equipment. In the receive direction, the unit decodes received PCM into VF and signaling information. During system outages, the unit provides various disconnect/make-busy routines for the trunk. The unit provides a 600-ohm, 4-wire, 2-way message circuit.

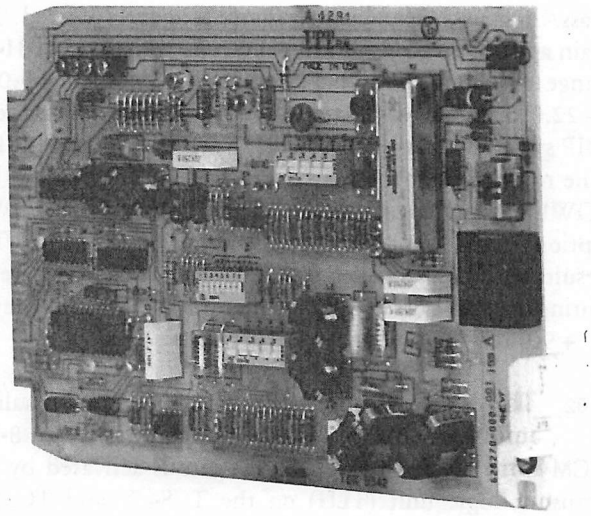


Fig. 1—4WEVF Channel Unit, 628270

2. DESCRIPTION

2.01 The unit mounts in the D448 multiplex shelf (channel unit mounting section) in connectors J1A through J24A (for Digroup A) or connectors J1B through J24B (for Digroup B). Installation procedures for the unit are provided in Section ITTR-18-441.

2.02 The unit is available in Group -0 only.

2.03 The unit consists of an epoxy-glass printed circuit board (PCB) and associated circuit components. The lower front edge of the PCB is fitted with a handle to facilitate insertion and removal of the unit from the shelf. An identification strip on the handle face indicates the unit mnemonic (4WEVF), last three digits of the model number, last three digits of the part number, and issue letter. The part number and issue letter are also located on the component side of the PCB.

2.04 The E LED (DS1), the BSY switch (S5), and the splitting card jack (J1) are located on the front edge of the PCB.

2.05 Printed circuit wiring is etched on both sides of the PCB. The unit inputs and outputs are terminated in gold-plated contacts on the rear edge of the PCB. These contacts mate with a 60-pin contact edge connector on the rear of the multiplex shelf.

3. FUNCTIONAL OPERATION (FIG. 2)

TRANSMIT VF CIRCUIT

3.01 The incoming VF is transformer-coupled, via part of the transmit (TX) level DIP switch, to the low-pass/high-pass filter where it is amplified and filtered. The gain applied to the input signal can be varied over a 31-dB range to compensate for VF input levels from +9.0 to −22.0 dBm (in 1-dB steps) by the selection of TX level DIP switch options [+1], [+2], [+4], [+8], and [+16]. The resulting signal is passed to the TX office wiring loss (OWL) compensation circuit. The TX prescription OWL options provide 0 to 1.5 dB of gain in 0.1-dB steps. The resulting signal is applied to the encoder to compensate for wiring/cabling losses. The resultant range for input levels is +9.0 to −23.5 dBm in 0.1-dB steps.

3.02 The encoder converts the VF signal and signaling information (Para. 3.05 through 3.07) to an 8-bit PCM word. When the TX AND gate is activated by the transmit logic unit (TLU) on the TCS4-X and TCS6-X leads, the 8-bit word is applied to the TLU via the TCD bus. The data is clocked out of the unit under control of the 1.536-MHz clock from the TLU.

RECEIVE VF CIRCUIT

3.03 An 8-bit PCM word from the receive logic unit (RLU) is applied to the decoder on the RCD bus. The decoder will only accept the data when the receive (RX) AND gate is activated by the RLU on the RCS4-X and RCS6-X leads. The decoder converts the PCM word into a VF signal and signaling information (Para. 3.08 through 3.12).

3.04 The VF signal is applied to the low-pass filter and passed through to the RX OWL compensation circuit. The RX prescription OWL options provide 0 to 1.5 dB of gain in 0.1-dB steps to the signal out of the low-pass filter to compensate for office wiring/cabling losses. The output of this circuit is further amplified. This amplification can be varied over a 31-dB range (in 1-dB increments) by the selection of RX VF level DIP switch options [−1], [−2], [−4], [−8], and [−16]. This provides output levels of +10.5 to −22.0 dBm in 0.1-dB increments with both the OWL and VF level options. The amplified VF is transformer-coupled to the C.O. equipment.

TRANSMIT SIGNALING

3.05 An idle condition is represented by an open circuit (or ground with switch S6 in the EM position) to the M lead or an open from the M to the MB lead. This condition is applied to the TX signaling (SIG) interface circuit (via a signal inverter with switch S6 in the PLR position), which in turn applies this information to the encoder. However, the encoder will not process the information until it is signaled on the TA/B lead by the TLU that the signaling frame is upcoming.

3.06 A busy condition is represented by presenting ground (with switch S6 in the PLR position) or battery (with switch S6 in the EM position) or a loop from the M to the MB lead. This condition is applied to the TX SIG interface circuit and processed as described in Para. 3.05.

3.07 Dialing is presented by the C.O. equipment as an alternate idle-busy applied to the M lead or as an alternate loop open-closure from the MB lead to the M lead. The dialing information is applied to the TX SIG interface circuit and processed as described in Para. 3.05.

RECEIVE SIGNALING

3.08 The decoder converts receive signaling information from the 8-bit PCM word when it is signaled by the RLU on the RA/B lead that the signaling frame is being processed by the terminal. The decoded signaling information is applied to the RX latch.

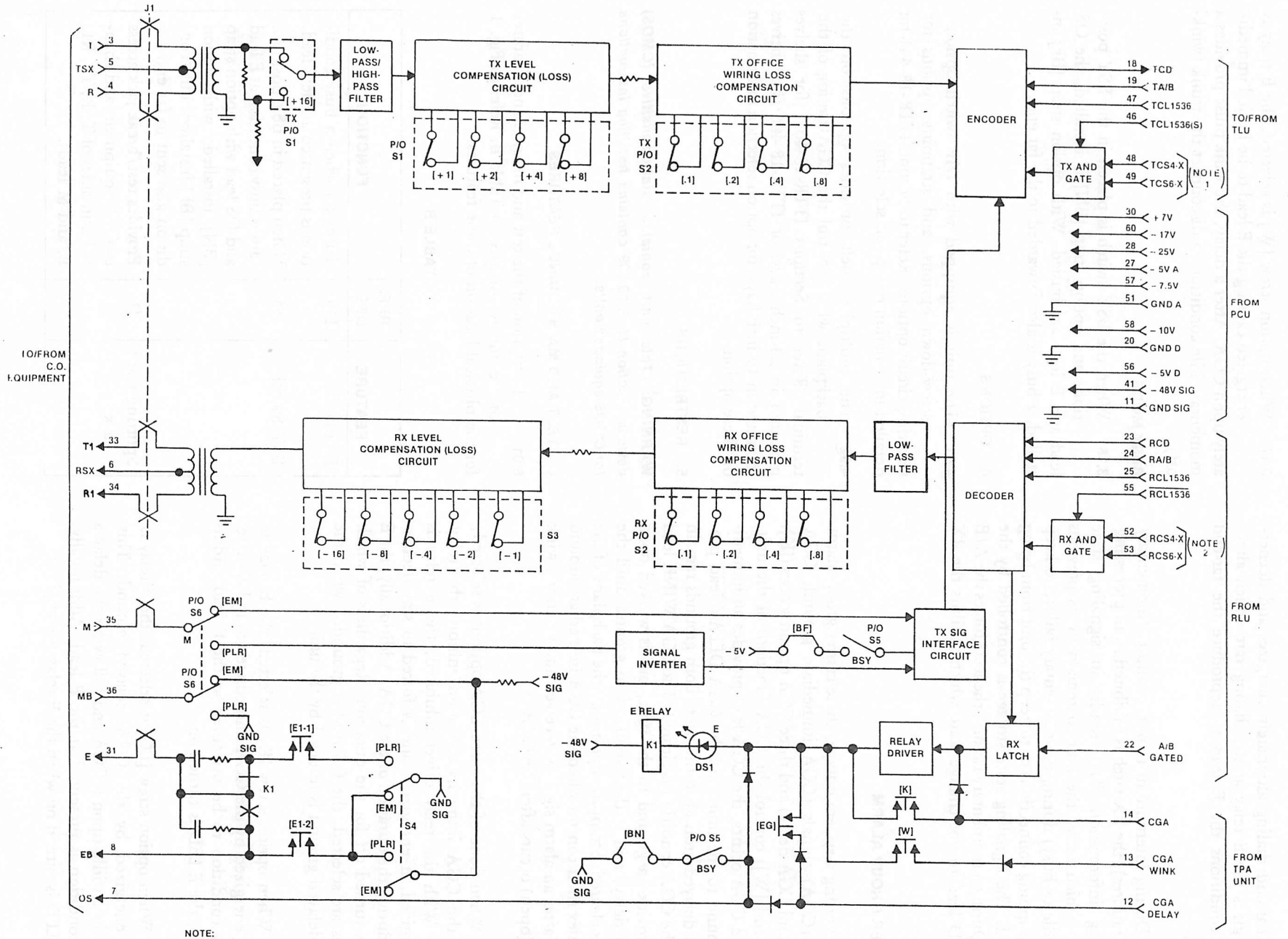
3.09 During an idle condition, the E relay is deenergized, the E LED is off, and the condition presented to the E lead will depend upon the position of option screws [E1-1] and [E1-2] and the position of switch S4 (Table A).

3.10 During a busy condition, the E relay is energized, the E LED is on, and the condition presented to the E lead will depend upon the position of option screws [E1-1] and [E1-2] and the position of switch S4 (Table A).

TABLE A

OPTION SCREWS*		SWITCH S4 POSITION	E-LEAD CONDITION	
[E1-1]	[E1-2]		IDLE	BUSY
Open	Open	PLR or EM	Open	Loop
Open	Selected	PLR	Open	−48V
Open or Selected	Selected	EM	Open	Ground
Selected	Selected	PLR	Ground	−48V

*Open option screw is in the up position; selected option screw is in down position.



NOTE:
1. MAY BE TCS4-A, B, C, OR D AND TCS6-A, B, C, D, E, OR F DEPENDING ON POSITION.
2. MAY BE RCS4-A, B, C, OR D AND RCS6-A, B, C, D, E, OR F DEPENDING ON POSITION.

B2614-B

Fig. 2—4WEVF Channel Unit, 628270, Functional Block Diagram

3.11 Far-end dialing alternately energizes and deenergizes the E relay at the dialing rate which alternately conditions the E lead to reproduce the far-end dialing.

3.12 During intermittent terminal failures (momentary failures), the RX latch is inhibited from processing signaling information. This results in signaling state storage, which forces the unit to remain in its previous state (idle or busy) during the momentary failure to keep from dropping connections or to keep the unit from being accessed. The signaling state storage is controlled by the RLU. During a momentary failure, the RLU forces the A/B GATED lead to not change state which inhibits the RX latch.

CARRIER GROUP ALARM

3.13 During a system outage, three carrier group alarm (CGA) signals (CGA immediate ground, CGA wink, and CGA delay) and three CGA option screws ([K], [EG], and [W]) control the CGA functions of the unit. When a CGA occurs, the CGA lead provides an immediate ground to the unit, and the CGA DELAY lead provides a delayed ground to the unit. Both grounds remain until the CGA condition is cleared. The CGA WINK lead also provides a ground to the unit, but is winked open after a delay, and is then returned to ground until the CGA is cleared. Strapping options on the backplane of the multiplex shelf control when the CGA immediate ground occurs after an alarm signal is received and when the wink pulse (open) occurs after the CGA.

3.14 When none of the three CGA options is selected, the CGA immediate ground inhibits the relay driver. With the relay driver inhibited, the E relay is deenergized, if energized, and is forced to stay deenergized during the duration of the CGA. Additionally, the E LED is turned off for the duration. Regardless of which options are selected, the OS lead is grounded when the CGA delayed ground is received by the unit.

3.15 When option screw [K] is selected, the E relay is energized by the CGA immediate ground causing a busy condition to be presented at the E lead. Additionally, the E LED is turned on.

3.16 When option screw [EG] is selected, the E relay is energized by the CGA delayed ground. This results in an idle upon a CGA and following the delay a busy condition is presented at the E lead. Additionally, the E LED is turned on when the E relay is energized.

3.17 When option screw [W] is selected, the E relay is energized causing the E lead to be busied immediately upon CGA. After a delay, the wink pulse provides a momentary idle condition to disconnect the trunk (wink-off).

BUSY MODE

3.18 When the BSY switch is placed in the BSY position, and option strap [BN] is installed, the OS lead and E lead are busied. With option strap [BF] installed, a busy is also forwarded to the far end.

4. OPTIONS

4.01 The unit is equipped with DIP switch options, screw-down options, and strapping options for selecting circuit options. Refer to Section ITTR-18-441 for detailed information on option selection.

4.02 The multiplex shelf provides options on the backplane which control the CGA timing of the terminal. Refer to Sections ITTR-18-405 (for shelves mounted in 23-inch bays) or ITTR-18-406 (for shelves mounted in 19-inch bays) for option selection information on these options.

5. RESTRICTIONS

WARNING: This unit contains static-sensitive (CMOS) devices. Section ITTR-18-599 contains handling instructions for CMOS-equipped units.

6. TEST AND MAINTENANCE FEATURES

6.01 A description of the test and maintenance features of the unit is provided in Table B. Refer to Fig. 1 for the physical location of these features.

TABLE B

FEATURE	REF. DES.	FUNCTION
E LED	DS1	Turns on when a busy condition is presented at the E lead.
BSY Switch	S5	When placed in BSY position, causes busy condition at E lead and OS lead with option strap [BN] installed; with option strap [BF] installed, busy condition also sent to far end.
Splitting Card Jack	J1	Provides test/break jack access to C.O. equipment and channel unit sides of T, R, T1, R1, E, and M leads.

7. TECHNICAL SUMMARY

7.01 A summary of technical specifications for the unit is given in Table C.

TABLE C

ITEM	SPECIFICATION
DC POWER	
Voltage	**Current Drain (nominal)**
−5V	19 mA
−10V	2.0 mA (at 5V)
+7V	5.0 mA (at 12V)
−17V	5.0 to 7.0 mA (at 12V), depending upon signal conditions
−48V Signaling Battery	0 to 13.0 mA, depending upon signal conditions
VF PERFORMANCE	
Impedance	600 ohms balanced
Levels	
Transmit	+9.0 to −23.5 dBm, adjustable in 0.1-dB steps
Receive	+10.5 to −22.0 dBm, adjustable in 0.1-dB steps
Loss Stability (End-to-End)	±0.5 dB over life in 95% of the circuits
Tracking (End-to-End)	
−37 to +3 dBm0 Input	0.5 dB maximum deviation
−50 to −37 dBm0 Input	1.0 dB maximum deviation
Idle Channel Noise (End-to-End)	23 dBrnc0 maximum
Signal-to-Distortion	
0 to −30 dBm0 Input	33 dB minimum overall; 35 dB minimum receive or transmit
−40 dBm0 Input	27 dB minimum overall; 29 dB minimum receive or transmit (deviation to 1 dBrnC for −21 dBm TLP)
−45 dBm0 Input	22 dB minimum overall; 25 dB minimum receive or transmit (deviation to 1 dBrnC for −20 dBm TLP)

TABLE C (CONT)

ITEM	SPECIFICATION
Single Frequency Distortion (at 0 dBm0)	
Input Swept from 0 to 12 kHz	−28 dBm0 maximum at any other frequency
Input between 1004 and 1020 Hz	−40 dBm0 or less at any other frequency of 0 to 4 kHz with a distortion contribution objective from either transmit or receive of typically 6 dB better
Return Loss	
1000 Hz	28 dB minimum
300 to 3000 Hz	23 dB minimum
Frequency Response (referenced 1020 Hz End-to-End)	
200 Hz	0, −3.0 dB
300 to 3000 Hz	±0.3 dB
3200 Hz	+0.3, −1.5 dB
3400 Hz	0, −3.0 dB
Longitudinal Balance (AT&T or IEEE Method)	
At each port with simplex lead open	
200 Hz	86 dB minimum
1000 Hz	80 dB minimum
3000 Hz	78 dB minimum
With 300 ohms between simplex lead and ground	
200 Hz	66 dB minimum
1000 Hz	60 dB minimum
3000 Hz	58 dB minimum
SIMPLEX OPERATION (AT EACH VF PORT)	
Simplex Lead Current (Sum of Tip and Ring Current)	60 mA maximum
Current Unbalance (Difference Between Tip and Ring Current)	1.5 mA maximum

TABLE C (CONT)

ITEM	SPECIFICATION
SIGNALING	
Transmit	
Threshold Voltage (M lead)	
Off-Hook (Detected)	
PLR	1 K ohm between M lead and −9V
EM	1 K ohm between M lead and −20V
On-Hook (Detected)	
PLR	30 K ohm between M lead and +9V
EM	100 K ohm between M lead and −60V
Battery Signal	−48 Vdc through a thermistor
Pulsing Distortion	
Input	8 to 12 pps, 30 to 90% break
Output	±2.0% maximum (average)
OPERATING ENVIRONMENT	
Temperature	0 to +55°C
Humidity	To 95% at 40°C (no condensation)
Altitude	To 14,000 ft (4,300 m)
DIMENSIONS	
Width	0.8 in. (1.9 cm)
Height	5.9 in. (15.0 cm)
Depth	9.7 in. (24.6 cm)
WEIGHT	0.5 lb (0.2 kg)

8. REPLACEABLE PARTS

8.01 This unit has no field-replaceable parts.

9. REFERENCES

9.01 The engineering drawings noted in Table D were used in the preparation of this Section.

TABLE D

TYPE	DRAWING NO.
Assembly	628270-000
Schematic	628270-002

9.02 Related information on the unit may be found in the ITTR Sections referenced in Table E.

TABLE E

TITLE	SECTION NO.
Connectorized Multiplex Shelf (MS/WC7, MS/WC5, MS/C7 and MS/C6), 628001, 628005, 628011 and 628015 (For 23-Inch Bays) — Option Selection, Installation and Pretest	ITTR-18-405
Connectorized Multiplex Shelf (MS19/WC7, MS19/WC5, MS19/C7 and MS19/C6), 628003, 628008, 628013 and 628018 (For 19-Inch Bays) — Option Selection, Installation and Pretest	ITTR-18-406
Special Service Channel Units — Option Selection and Installation	ITTR-18-441